

Caudofoveata (Mollusca) from off the northern coast of the Iberian Peninsula

Caudofoveata (Mollusca) de las costas del norte de la Península Ibérica

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ABSTRACT

New records of Caudofoveata (Mollusca) from samplings off the coast of northern Spain are communicated. The biogeographically new Spanish and French findings included *Scutopus ventroineatus*, *Falcidens vasconiensis* and *Prochaetoderma iberogallicum* n. sp. which are systematically presented.

RESUMEN

Se presentan nuevos hallazgos de Caudofoveata (Mollusca) de muestras obtenidas frente a las costas del norte de España. En las muestras españolas y francesas que resultaron nuevas desde el punto de vista biogeográfico se recolectaron las especies *Scutopus ventrolineatus*, *Falcidens vasconiensis* y *Prochaetoderma iberogallicum* n. sp. encluyéndose en el presente trabajo descripciones de estas tres especies..

KEY WORDS: Caudofoveata, Aplacophora, new records, Spain, *Prochaetoderma iberogallicum* new species.

PALABRAS CLAVE: Caudofoveata, Aplacophora, nuevas citas, España, *Prochaetoderma iberogallicum* spec. nov.

INTRODUCTION

The members of the small molluscan class Caudofoveata (formerly Aplacophora-Chaetodermomorpha) are marine micro-omnivores measuring 2-150 mm in length which burrow within muddy sediments and have an adapted, vermiform body with reduced pedal sole (midventral fusion of the lateral mantle rims, etc.; for general organization see SALVINI-PLAWEN, 1985). The Caudofoveata are currently classified into three families and at present the class includes about 100 named species, 17 of

which come from European waters. The knowledge of the Caudofoveata from West-European shelf regions, however, is very scanty (cf. SALVINI-PLAWEN, 1997) and more intensive investigation is needed to provide organizational, biological, and biogeographic-faunistic information.

During recent years, the survey of the Iberian fauna has resulted in intensified research on coastal and off-shore habitats of the region. This initiated various scientific campaigns to collect

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and sample additional material. In the present contribution new records of Caudofoveata, including *Prochaetoderma iberogallicum* n. sp., from samplings off the coast of northern Spain are communicated.

MATERIAL AND METHODS

The new records of Caudovoveata stem from Spanish and French samples off the coast of northern Spain.

The Spanish material (provided by O. García-Alvarez and V. Urgorri) comes from the *Fauna Iberica II* cruise from the following stations:

Sta. 124 A: Off Ribadesella (Asturias), 43° 49' 45.6" - 43° 49' 53.4" N, 05° 05' 02.4" - 05° 05' 49.8" W; 540-543 m, mud (02/18.06.91);

Sta. 148 A: Off San Sebastián (Guipuzcoa), 43° 29' 33.6" - 43° 29' 52.8" N, 02° 01' 34.8" - 02° 00' 12" W; 135-143 m, mud (01/22.06.91);

Sta. 150 A: Off Zumaya (Guipuzcoa), 43° 22' 10.8" - 43° 23' 08.4" N, 02° 15' 00" - 02° 15' 12.6" W; 93-101 m, sand with shells (02/22.6.91);

Sta. 153 A: Off Ondarroa (Guipuzcoa), 43° 27' 14.4" - 43° 27' 46.2" N, 02° 23' 25.2" - 02° 24' 48.6" W; 129-132 m, mud (01/24.06.91).

The French material (held in the Mus. Nat. Hist. Nat., Paris) comes from:

N. O. *Thalassa* cruise Sta. W 365: Off Santander, 43° 35' 36" N, 03° 33' 48" W; 300-350 m.

Cap Breton Sta. 88-DE 07: 43° 58' 65" N, 02° 05' 27" W, 170 m.

Cap Breton Sta. 88-DE 05: 43° 57' 42" N, 02° 05' 16" W, 164 m.

For investigation, the mantle scales were isolated under a stereo-microscope and examined under an interference microscope; the buccal apparatus was macerated with hypochlorite (ordinary household bleach) to demonstrate the isolated internal hard parts below the microscope.

RESULTS

The studied material included individuals of three species representing the

three known families. They are systematically presented.

Family Limifossoridae Salvini-Plawen, 1969

Caudofoveata with bipartite radula in several transverse rows upon normally developed radula membrane,

without additional cuticular supports. Four genera (*Scutopus*, *Psilodens*, *Limifossor*, *Metachaetoderma*).

Genus *Scutopus* Salvini-Plawen, 1968

Radula teeth with median denticles (but without median wings at base). Pedal shield homogeneous.

Type species; *Scutopus ventrolineatus* Salvini-Plawen, 1968; Bergen, Norway.

Scutopus ventrolineatus Salvini-Plawen, 1968

Material examined: There are two records off the coast of northern Spain: N. O. *Thalassa* sta. W 365 (see SALVINI-PLAWEN, 1996) and *Fauna Iberica II* sta. 124 A (one fragment of 12 mm in length).

Diagnosis: Usually up to 20 mm, seldomly up to 35 mm in length, body very

slender and often coiled. Anterior portion of midbody with distinct mid-

ventral suture line; pedal shield purely postoral. Radula teeth hardly sclerotized, with 9-11 medial denticles not extending to curved distal portion.

Remarks: This species is well-documented in Scandinavian waters and has also been recorded in British waters, the Golfe du Lion, off Barcelona, off Málaga

and off Durban/SE Africa (SALVINI-PLAWEN 1975, 1977, 1997; SALVINI-PLAWEN, STEINER AND TODT, 1998). The new Spanish record north of Ribadesella (from 124 A) includes a fragment only, which, however, shows the specific mantle scales as well as the midventral suture.

Family Prochaetodermatidae Salvini-Plawen, 1969

Caudofoveata with bipartite radula in several transverse rows, each of which is accompanied by elaborations of the

radula membrane. Foregut with one pair of spatulate buccal struts ("mandibles"). One genus only (*Prochaetoderma*).

Genus *Prochaetoderma* Thiele, 1902

Radula teeth with median serrate extension, radula membrane with one or two pairs of lateral wings along with each pair of teeth, central radula membrane reinforced below each pair of teeth. Pedal shield paired, lateral of mouth; posterior body more or less tapered ("tailed"), mantle scales generally arranged dorsocaudally. Type species: *Chaetoderma raduliferum* Kowalevsky, 1901; Sea of Marmara. Three subgenera:

Subgenus *Prochaetoderma* Thiele, 1902 (emend. in Salvini-Plawen, 1992), including *Spathoderma* Scheltema, 1985, *Rhabdoderma* Scheltema, 1989 (non Reiss, 1888 [Crossopterygii +]) and *Niteomica* Ivanov, 1996 (= *Scleroderma* Ivanov, 1995); Members with one lateral projection of radula membrane alongside each radula tooth. Mantle scales differently-shaped, i. e. flat, straight or axially cur-

ved, with the basal portion sometimes transversely curved and with the distal portion often set off, elongated and keeled or rounded in cross-section; no longitudinal groove. Type species: *Chaetoderma raduliferum* Kowalevsky, 1901.

Subgenus *Chevroderma* Scheltema, 1985: Members with one lateral projection of radula membrane alongside each radula tooth. Mantle bodies slightly asymmetrical with a longitudinal groove and delicate, chevron-shaped cross grooves. Type species: *Chevroderma turnerae* Scheltema, 1985.

Subgenus *Lonchoderma* Salvini-Plawen, 1992: Members with two lateral projections of radula membrane alongside each radula tooth; posterior body not distinctly tapered. Mantle scales flat, elongated. Type species: *Prochaetoderma longisquamosum* Salvini-Plawen, 1986.

Prochaetoderma (Prochaetoderma) iberogallicum spec. nov. (Figs. 1, 2)

Material examined: The species comes from three samples collected during cruise *Fauna Iberica II* from off the coast of Guipuzcoa (San Sebastián) in 93-143 m.: sta. 148 A (7 ind. up to 1.5 mm); sta. 150 A (10 ind. up to 1.5 mm); sta. 153 A (6 ind. up to 1.8 mm, 1 ind. 2mm in body length). All specimens have been examined externally (scales); three specimens (one of each sample) of up to 1.3 mm in body length have been investigated with respect to the internal hard parts.

The holotype (one specimen from sta. 153 A: Fig. 1 B) is deposited in the Museo Nacional de Ciencias Naturales, Madrid, no. 15.01/2-A; the paratype (sta. 153 A: Fig. 1 A) = no. 15.01/2-B. Other material is not appointed.

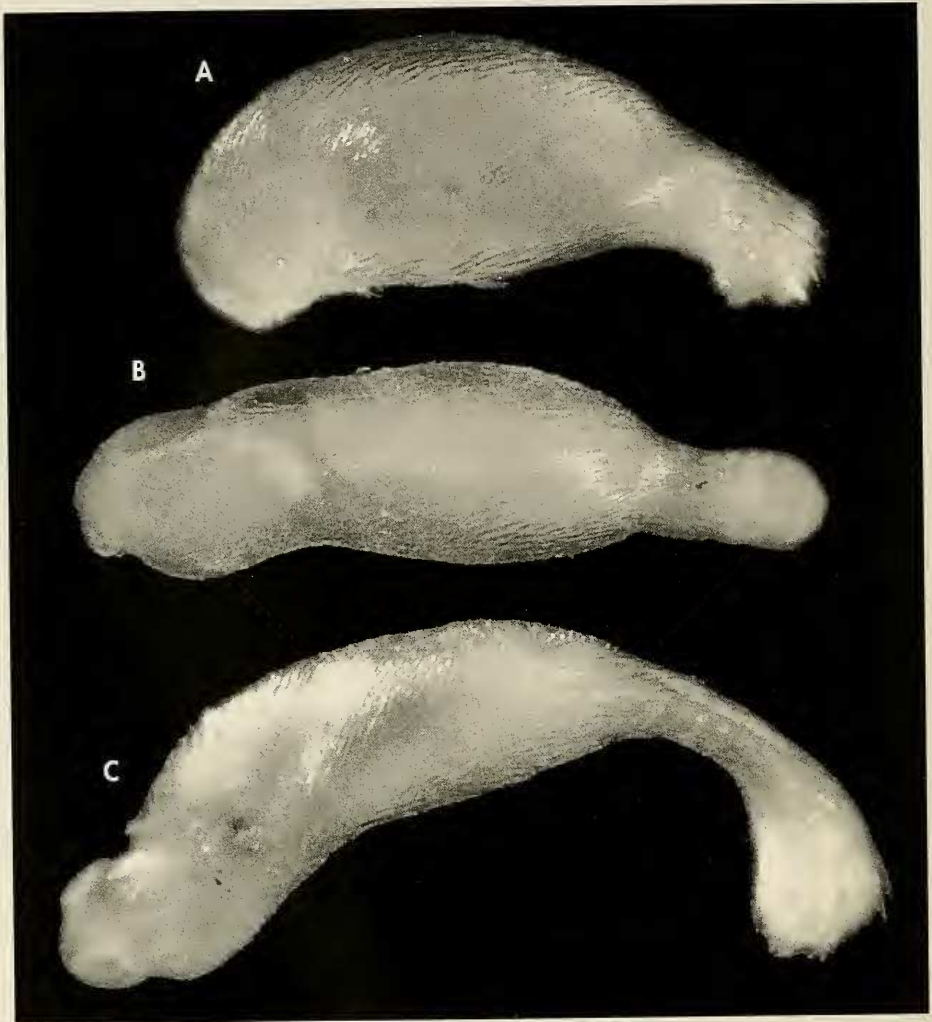


Figure 1. *Prochaetoderma iberogallicum* spec. nov. Three preserved specimens from sta. 153 A (size: A = 1.3 mm, paratype; B = 1.45 mm, holotype; C = 1.8 mm).

Figura 1. *Prochaetoderma iberogallicum* spec. nov. Tres ejemplares de la muestra 153 A (tamaño: A = 1,3 mm, paratipo; B = 1,45 mm, holotipo; C = 1,8 mm).

Diagnostic description: The specimens, up to 1.8 mm in body length, exhibit a fairly stout trunk with short, distinctly set off posterior end (Figs 1 A, B); the gonad is visible in animals of 1.0-1.8 mm. One single specimen from sta. 153 A measured in life 2 mm (preserved 1.8 mm) with a more tapering posterior body and not clearly visible gonad (Fig.

1 C). The mantle scales are dorso-caudally arranged, short (up to 130 μ m) and flat, the basal portion is generally continuous with the distal portion (Fig. 2A), i. e. the scales scarcely show a subdivision into blade and base (cf. SCHELTEMA, 1985); some scales at the midbody exhibit a distinct asymmetry in the outline of the base (Fig. 2A, f).

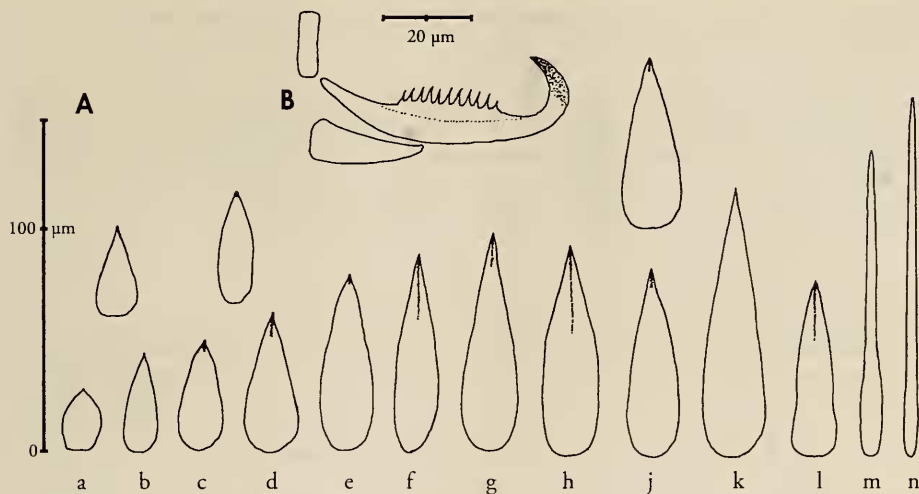


Figure 2. *Prochaetoderma iberogallicum* spec. nov. A: sequence of types of mantle scales from the peri-oral region (a) to the region of the pallial cavity (m-n); B: one tooth of the radula with adjacent, lateral and ventral elaboration of radula membrane.

Figura 2. *Prochaetoderma iberogallicum* spec. nov. A: tipos de escamas del manto desde la región perioral (a) hasta la región de la cavidad paleal (m-n); B: un diente de la rádula y las formaciones adyacentes (lateral, ventral) de la membrana radular.

The radula apparatus in the examined specimens measured about 175 μm and includes eight pairs of teeth of 50-55 μm length; at most, five of these are sclerotized distally. The oral mid-edge of each tooth forms a poorly developed membrane with 9-15 denticles (Fig. 2B). The spatulate buccal struts range from 80 \times 180 μm to 100 \times 300 μm in length.

Remarks: All specimens except for the 2 mm individual from sta. 132 A (Fig. 1 C) are, in body shape, very similar to the Mediterranean *P. raduliferum* f. *brevis* as discussed in SALVINI-PLAWEN (1977) and SALVINI-PLAWEN ET AL. (1998). The mantle scales at the anterior body of the *brevis*-form, however, are specifically different and show a distinct distal keel; the median membrane of the radula teeth is provided with 15-20 denticles (SALVINI-PLAWEN, 1977, SALVINI-PLAWEN ET AL. 1998). The scales of the 2 mm individual (Fig. 1 C) are fully identical as figured (Fig. 2 A) and all present specimens are thus regarded to belong to *P. iberogallicum* spec. nov.. The scales

of the new species likewise differ from those of typical *P. raduliferum* (see SALVINI-PLAWEN, 1972, SALVINI-PLAWEN ET AL., 1998). They are also clearly distinct from the mantle bodies of *P. yongei* Scheltema, *P. clenchi* (Scheltema) and *P. (Chevroderma) turnerae* (Scheltema), all three species which having collected from the basin of the Bay of Biscay at 1175-4760 m depth (SCHELTEMA, 1985).

Comparing the present new species with the Mediterranean *P. raduliferum* f. *brevis* confirms that the differences between this *brevis*-form and the typical *P. raduliferum* (Kowalevsky) with respect to the types and size of the mantle scales (SALVINI-PLAWEN ET AL., 1998: Figs 4, 5) are likewise specific. The *brevis*-form is thus proposed to represent a separate species *P. (Prochaetoderma) brevis* spec. nov. with the characters as defined in SALVINI-PLAWEN ET AL., 1998 (holotype = therein Fig. 3 from sta. M 1/off Málaga at 197-211 m: Mus. Nac. Cienc. Nat., Madrid, no. 15.01/1-A; paratype *ibidem*, no. 15.01/1-B).

Family Chaetodermatidae Ihering, 1876 (Opinion 764)

Caudofoveata with strongly modified, dome-shaped radula apparatus: one pair of teeth or none, radula membrane strengthened to a conical 'basal plate', adjacent pharyngeal cuticle

forming pair(s) of distally pointed supports ('lateral plates'); midgut with cuticular 'stomach shield'. Two genera (*Falcidens*, *Chaetoderma* including *Caudofoveatus* (Ivanov, 1981).

Genus *Falcidens* Salvini-Plawen, 1968

Radula teeth representing one pair of sickle-shaped teeth which touch or unite

proximally. Type species: *F. crossotus* Salvini-Plawen, 1968; Bergen, Norway.

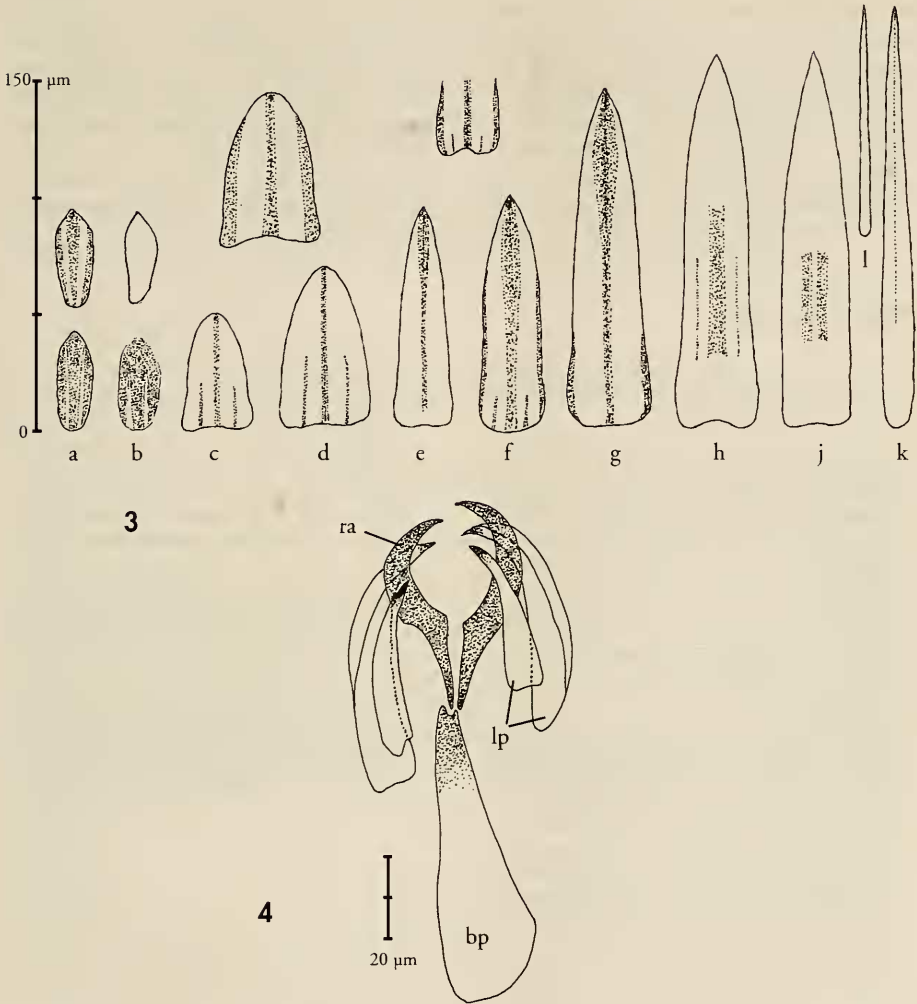
Falcidens vasconiensis Salvini-Plawen, 1996 (Figs. 3, 4)

Material examined: Holotype (MNHN Paris; mantle scales in part eroded) and five more specimens stemming from the two new samples from the southeast Bay of Biscay: a) Cap Breton sta. 88-DE 07: four terminally incomplete specimens of up to 6.5 mm in body length; b) Cap Breton sta. 88-DE 05: one complete specimen measuring 5.5 mm and one fragment of posterior body.

Revised description: The original diagnostic description (see mantle scales; radula teeth basally pointed, without symphysis; pedal shield with frontal mouth-cleft; cf. SALVINI-PLAWEN, 1996), based on a single specimen from off Cap Breton, can now be enlarged and complemented. The additional material reveals that there is some individual variation in the dominance of the different types of mantle scales. Especially in the anterior body (foregut region), the detailed shape and sculpture of the dominant scales as shown in the holotype specimen (SALVINI-PLAWEN, 1996: Fig. 3 a-b) may vary (or possibly represent a somewhat eroded state): the dominant type, with its two proximally deepening and widening furrows, is very characteristic in the present specimens (Fig. 3 a-b). Overall, the mantle cover fairly well resembles that of the northern *F. crossotus* (likewise showing some variation). Differences exist, however, in the subsequent scales of *Falcidens vasconiensis* when compared with *F. crossotus*: in *F. vasconiensis* (Fig. 3 c-d) they always show a distinct median keel and also a pair of shorter lateral keels. In

contrast, the short lateral keels are generally lacking in respective scales of *F. crossotus*. In the Mediterranean *F. gutturosus* (Kowalevsky, 1901), this type of scale shows a weak median keel only, and more often some irregular longitudinal structures (grooves, keels) or alternatively several short proximal keels (see Figures 4 and 5 in SALVINI-PLAWEN, 1996). Another difference in *F. vasconiensis* is the lack of those basally alate scales which are typical of *F. crossotus* and *F. gutturosus* (SALVINI-PLAWEN, 1996: Figs. 4g, 5).

In contrast to the similarities of the mantle scales between *F. vasconiensis* and *F. crossotus*, the radula apparatus of *F. vasconiensis* more closely resembles that of the Mediterranean *F. gutturosus*. As shown in Fig. 4, the lateral supports are differentiated by two pairs of plates; these are of unequal size and both pairs have sclerotized tips. In *F. gutturosus*, the two pairs of lateral plates are of equal size and sclerotized elements are additionally present (see KOWALEVSKY, 1901: Figs 25, 26); in *F. crossotus*, only one pair of lateral plates is elaborated (SALVINI-PLAWEN, 1975).



Figures 3, 4. *Falcidens vasconiensis*. 3: sequence of types of mantle scales from the stomodeal-region (a-b) to the region of the pallial cavity (k-l); 4: radula apparatus with sickle-shaped teeth (ra), basal plate (modified radula membrane bp) and two pairs of lateral supports (lp).

Figuras 3, 4. Falcidens vasconiensis. 3: tipos de escamas del manto desde la región estomodeal (a-b) hasta la región de la cavidad paleal (k-l); 4: aparato de la rádula con el par de dientes (ra), la placa basal (membrana radular modificada bp) y los dos pares de soportes laterales (lp).

DISCUSSION

The present records from surveys from three regions indicate that more intensive research will help to enlarge our faunistic knowledge. This pertains not only to the geographical distribution

of different species (*Scutopus ventrolineatus*, *Falcidens vasconiensis*; cf. SALVINI-PLAWEN, 1997) but also to biodiversity. The record of a new species distinctly underlines the current gap. Moreover,

the finding of the new species *Prochaetoderma iberogallicum* in the littoral zone is somewhat unexpected because members of this genus appear to predominantly inhabit deep-sea regions (SCHELTEMA, 1985), although the Mediterranean *P. raduliferum* ranges in depth from 30 m to 2415 m (SALVINI-PLAWEN, 1977, 1997) and *P. breve* spec. nov., separated herein from

P. raduliferum, ranges from 79 m to 300 m. Based on the record of *P. iberogallicum* with several specimens in each of the three samples off the coast of Guipuzcoa, this species probably inhabits the littoral zones of the Bay of Biscay more widely (hence the species name). This probability likewise refers to *Falcidens vasconiensis* (cf. SALVINI-PLAWEN, 1997).

BIBLIOGRAPHY

- KOWALEVSKY, A., 1901. Sur le genre *Chaetoderma*. *Archives de Zoologie expérimentale et générale*, Sér. 3, 9: 261-283.
- SALVINI-PLAWEN, L. v., 1972. Die Caudofoveata des Mittelmeeres und das Genus *Scutopus* (Mollusca, Aculifera). *Fifth European Marine Biology Symposium* (Piccin, Padova): 27-51.
- SALVINI-PLAWEN, L. v., 1975. Mollusca: Caudofoveata. *Marine Invertebrates of Scandinavia*, 4: 1-55.
- SALVINI-PLAWEN, L. v., 1977. Caudofoveata (Mollusca), Priapulida und Apode Holothurien (*Labidoplax*, *Myriotrochus*) bei Banyuls und im Mittelmeer allgemein. *Vie et Milieu*, 27 (A/1): 55-81.
- SALVINI-PLAWEN, L. v., 1985. Early evolution and the primitive groups. In E. R. Trueman and M. R. Clarke (Eds.): *The Mollusca* (Academic Press), 10 (Evolution): 59-150.
- SALVINI-PLAWEN, L. v., 1992. On certain Caudofoveata from the Vema-Expedition. In E. Gittenberger and J. Goud (Eds.): *Proceedings of the Ninth International Malacological Congress*, Unitas Malacologica, Leiden: 317-333.
- SALVINI-PLAWEN, L. v., 1996. *Falcidens vasconiensis* spec. nov. (Mollusca, Caudofoveata) du plateau continental du Golfe de Gascogne. *Bulletin de la Société Zoologique de France*, 121: 339-345.
- SALVINI-PLAWEN, L. v., 1997. Fragmented knowledge on West-European and Iberian Caudofoveata and Solenogastres. *Iberus*, 15: 35-50.
- SALVINI-PLAWEN, L. v., STEINER, G. AND TODT, CH., 1998. Notes on marine meiofauna from muddy bottoms off Málaga (Spain). *Graellsia*, 54: 124-127.
- SCHTELTEMA, A., 1985. The aplacophoran family Prochaetodermatidae in the North American Basin, including *Chevroderma* n. g. and *Spathoderma* n. g. (Mollusca, Chaetodermomorpha). *Biological Bulletin*, 19: 484-529.